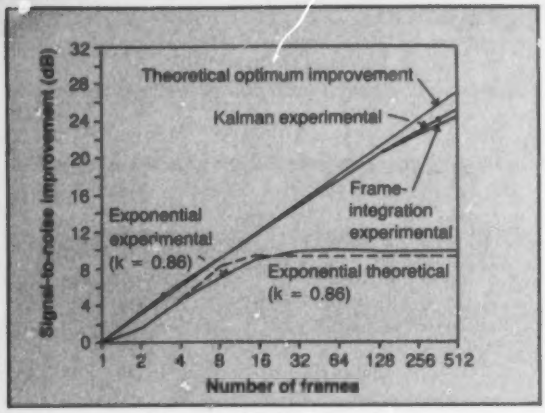

USING KALMAN AVERAGING, the signal-to-noise ratio continues to improve with additional frames. Exponential averaging stops improving after 16 frames.

al concepts that chemists formerly had to draw by hand. For example, a modeling program can simulate molecular interaction and plot molecular changes.

A program also can display molecular conformal twisting, interatomic distances, and molecular-surface volume, and it can generate on the screen bimolecular complexes, whether or not anyone has actually made them in a laboratory.

In general, molecular modeling is to molecular analysis and design what three-dimensional solids modeling is to mechanical computer-aided engineering. That is, molecular modeling helps scientists make intelligent decisions about materials, how to make them and, in some cases, which ones to make. The techniques also permit scientists to perform interactive testing of hypotheses.

Major applications for molecular modeling include the design of improved drugs, the study of mutant cells, crystallography, polymer synthesis, protein modeling and engineering, and materials science. A significant future application is auto-docking, or computer-calculated molecular binding, a "fast-track" method for synthesizing and marketing drugs.

Digital image analysis in the future

To get an idea as to where the digital image-analysis industry is heading, our consulting group interviewed a number of industry executives and obtained information from several industry forums. These efforts led to the conclusion that, within the next two years, the field will undergo a 35 to 40% growth.

Several trends already are evident. Among the most significant are:

□ Use of image analysis in process-control operations, nondestructive testing, and materials quality assurance in the manufacturing plant.

□ Application of industrial x-ray NDT and EDS imaging is growing as industrial workers perceive that the operating environment can be made safe.

□ Medium-cost ($25,000 to $30,000) special-application, no-frills image-analysis systems are beginning to establish their own place between low-end, personal-computer-based systems ($15,000 to $35,000) and high-end, general-purpose ($60,000 to $90,000) systems.

□ More and more often, microscope vendors are providing image-analysis systems as add-on options.

□ Both the size and the cost of image-analyzer systems is continuing to decline. Within the next three or so years, system cost will decrease another $5,000 to $7,000, while the performance is increasing.

□ There is, at present, a continuing rapid increase in the availability of application-specific software that performs complex analyses, automates data analysis, and aids in decision making.

□ True-color imaging will become available on low-cost systems, where it has, until now, been an expensive add-on item.

□ Increasing use of SEM and x-ray dispersive spectroscopy in biomedical, materials, and particle characterization is generating new demands for rapid, economical, high-resolution image analysis.

□ The demand to automate entire analysis procedures in quality assurance facilities and to integrate these analyses with process-control computers continues to increase.

□ Once SEM facilities are integrated with submicrometer-scale semiconductor production lines in 1988 and 1989, the need for image analysis in these applications will increase.

Thus, the recent improvements in image-analysis equipment and in the techniques for applying it are, indeed, making it possible for scientists and engineers to see details never before seen. From this new information, manufacturers can be sure that the products they sell will do the jobs for which they are intended.

Industrial hygienists can learn what hazards may be present in the environment—and how best to deal with them. Biomedical researchers can quickly decide among competing structures of drugs to combat disease. And industrial R&D people can take advantage of the information now available to improve their processes and design new chemical structures for maximum usefulness in practical applications. R&D

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High **377** Medium **379** Low **381**

THE AUTHOR

Fred U. Wetzler is a consultant who specializes in writing and editing technical articles for trade journals and aiding in the preparation of high-technology corporate, engineering, and service publications. He formerly wrote a monthly column, "Washington Trends," for *Research/Development*, one of the forerunners of *Research & Development* magazine.

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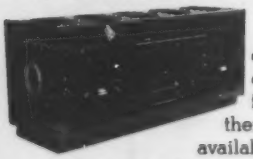

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OPINION POLL RESULTS

Few complaints from researchers about workplaces

IN THE MAY 1987 issue of *Research & Development* we asked what you thought about the laboratory environment in which you work. In general, most respondents seem to be rather pleased with their research lab facilities, with 57% rating their workplaces at least good and 58% considering their immediate work environment to be pleasant. Results of the survey follow:

1. *Is your immediate laboratory environment a pleasant place to work?*
   a. Yes . . . 58% b. No . . . 22%
   c. Indifferent 21
2. *Do you have adequate benchtop space on which to do your work?*
   a. Yes . . . 59% b. No . . . 41%
3. *Does your lab bench/work area have adequate storage space?*
   a. Yes . . . 50% b. No . . . 50%
4. *Do you have an office area separate from, but in close proximity to, your work area?*
   a. Yes . . . 73% b. No . . . 27%
5. *Is your lab equipped with adequate safety equipment,* i.e., *eyewash station, fire extinguishers, etc.?*
   a. Yes . . . 72% b. No . . . 21%
6. *Is the lighting in your work area sufficient for most of the jobs you do?*
   a. Yes . . . 92% b. No . . . 8%
7. *Does the HVAC system keep you comfortable?*
   a. Yes . . . 26% b. No . . . 22%
   c. Most of the time 52
8. *Does your lab have lounge/conversation areas where you can discuss ideas away from the bustle of lab activity?*
   a. Yes . . . 41% b. No . . . 59%
9. *How many periodicals relating to the work done at your facility does the reference library subscribe to?*
   a. 0 to 5 . . . 19% c. 11 to 20 . . . 14%
   b. 6 to 10 . . . 17 d. 21 or more . . . 45
   e. We don't have a reference library 5
10. *Is the building exterior esthetically pleasing?*
    a. Yes . . . 35% b. No . . . 31%
    c. Indifferent 34
11. *Are you usually able to park within a reasonable walking distance from the building?*
    a Yes . . . 85% b. No . . . 15%
12. *How many miles do you travel to get to work?*
    a. 0 to 5 . . . . . 37% c. 11 to 20 . . . . . 24%
    b. 6 to 10 . . . . . 23 d. 21 or more 16
13. *All things considered, how do your rate your workplace?*
    a. Excellent . . . 14% d. Adequate, but poor 13%
    b. Good 43
    c. Fair . . . . . 27 e. Inadequate 4